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MODEL IN-AET-055-PA PORTABLE OZONE SPOT CHECKER

OPERATING INSTRUCTIONS



Title: Model IN-AET-055-PA Portable Ozone Spot Checker Operating Instructions	Doc. #: 610-0177-01	Rev: A
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Safety regulations

The following safety regulations must be observed without fail.

1. Under no circumstances should the IN-AET-055-PA be used except by trained ozone detection personnel and not until the accompanying instruction, labels, and other literature have been carefully read and understood, and the other precautions followed.
2. Read and understand all applicable federal, state, and local health and safety laws and regulations including OSHA, and ensure that you are in complete compliance with said laws and regulations before using the IN-AET-055-PA.
3. Read and understand all instructions before using the IN-AET-055-PA.

Cautions

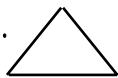
The IN-AET-055-PA is a precision instrument. Execute care in handling and storing, paying special attention to the following points:

1. Avoid hard mechanical impact to the IN-AET-055-PA. Rough handling or dropping of the IN-AET-055-PA may destroy the internal sensor and/or cause degradation of sensitivity as well as malfunction.
2. Do not expose the IN-AET-055-PA to water, rain, high humidity, high temperature or extreme temperature fluctuation.
3. Do not operate or store the IN-AET-055-PA in atmospheres contaminated with silicon. The sensor of the IN-AET-055-PA will be poisoned.
4. Do not disassemble, alter components or electrical circuits.
5. Do not use benzene, thinner or a wet cloth to clean the IN-AET-055-PA.

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General Precautions

WARNINGS: ...



The following is a list of warnings that appear in this operation manual. The operator must read all warnings to ensure safe and proper use of the IN-AET-055-PA. It is most important to ensure the safety of the operator at all times from poisoning or explosions. Carefully read, understand, and follow all the precautions.

1. Ozone (O₃) is a toxic gas. Read and understand all applicable federal, state, and local health and safety laws and regulations including OSHA, and ensure that you are in complete compliance with said laws and regulations before using the IN-AET-055-PA.
2. Ozone (O₃) is a toxic gas. Once its presence has been detected, the operator should take all appropriate precautions to avoid exposure including vacating the area if necessary.
3. To prevent ignition of explosive atmospheres, batteries must be loaded or changed in an area known to be non-explosive.
4. Measurement performed near radio, walkie-talkie or device emitting strong electromagnetic waves may cause inaccurate readings.
5. To maintain the accurate reading span adjustment must be performed periodically (at least once every 6 months).
6. Do not turn on the IN-AET-055-PA without the Filter element inside the Filter holder. Dust may get into the micro pump causing excessive noise during sampling operation.
7. Replace the Filter element regularly. The new Filter element should be aged for Approximately 2 hours before measurement. The reading on the LCD may be lower than normal.
8. Use only *IN USA, INC.* recommended spare parts. Substitution parts could result in damage to the equipment may create hazardous conditions and will void the warranty.
9. Use this equipment as recommended in this manual. Use of the equipment in ways other than specified by *IN USA* may create hazardous conditions.
10. Do not use the IN-AET-055-PA for detecting mixtures other than ozone

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11. Do not perform the measurement in the presence of organic solvents, reducing gases, or smoke is suspected. The measurement in an atmosphere contaminated with organic solvents, reducing gases such as nitrogen, monoxide etc., or smoke may cause lower indication than actual ozone concentration.

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General Notes

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3. IN USA, Inc. reserves the right to make changes to the product covered in this manual to improve performance, reliability or manufacturability. Make sure that this Manual is used with the original Product it was shipped with.
4. Although every effort has been made to ensure accuracy of the information contained in this manual, IN USA, Inc. assumes no responsibility for inadvertent errors. Contents of the manual are subject to change without notice.
5. IN USA, Inc. assumes no responsibility for the use of any measuring schemes described herein.
6. This product is not intended or recommended by IN USA, Inc. for use in (a) medical therapy or physical therapy of any kind whether as a direct or adjunct part of such therapy, including, without limitation, life support (i.e., critical medical) applications or (b) any nuclear facility applications. IN USA, Inc. will not knowingly sell this product for use in such applications. Use of the IN USA, Inc. product in connection with medical or like treatment cannot be reasonably expected to produce accurate monitoring of therapy or treatment and may cause failure of the life support device or significantly affect its safety or effectiveness. Use by any direct purchaser or after-market purchaser in such applications, whether or not known to IN USA, Inc., shall absolve IN USA Inc. of any responsibility or liability to such purchaser(s) or to any person(s) subjected to or affected by such use knowingly or unknowingly.

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Contacting IN USA, INC.

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About IN USA, INC.

IN USA, Inc. manufactures instrumentation and control systems. The company is the world's leading manufacturer of ozone equipment. IN USA, Inc. provides customized, optical-based monitoring systems which include sophisticated process control hardware and software.

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INTRODUCTION

The Model IN-AET-055-PA is a new state of the art Hand Held Ozone Spot Checker. It is ideal for applications requiring locating and quantifying instantly and precisely low levels of Ozone in and around any ozone installation. The IN-AET-055-PA is very compact, it fits in the palm of a hand and is battery operated, therefore it is ready to perform the measurement you need anywhere you need it.

The IN-AET-055PA is based on Semiconductor Thin Film Sensing technology. The sensing element consists of a proprietary substrate that is designed to be highly sensitive to Ozone. In the presence of ozone the substrate changes its electrical resistance. The on board microprocessor measures this change of resistance precisely and converts it instantly into an ozone concentration expressed in PPB_v. This precise measurement is continuous and can be viewed on an easy to read digital display. The measurement can also be accessed through built-in USB and Analog Output data ports. These features and more render the IN-AET-055-PA the best in its class, making it an ideal instrument to locate and quantify Ozone levels instantly and precisely.

ENVIRONMENT

Operation environment

The IN-AET-055-PA is not designed to be Intrinsically Safe. DO NOT USE THE IN-AET-055-PA IN EXPLOSIVE ATMOSPHERES.

The IN-AET-055-PA should not be operated in atmospheres contaminated with Silicon. Operation in such atmospheres will cause degradation of sensor sensitivity as well as malfunction. The sensor of the IN-AET-055-PA will be poisoned by Silicon compound.

Measurement performed under the following environment may cause inaccurate readings.

Desiccated atmosphere

The measurement of ozone concentration in atmosphere specially desiccated such as silica gel filtered air may cause higher reading than actual concentration.

Decompressed or pressurized atmosphere

Measurement of ozone concentration in a decompressed or pressurized area should be avoided, it may cause inaccurate readings due to an abnormal air

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flow rate for the IN-AET-055-PA.

Storage environment

The IN-AET-055-PA is a precision instrument. To prevent impairment of the instrument accuracy due to extreme temperatures and humidity, be sure that the Storage Temperature of the IN-AET-055-PA is 40 F to +122 F (5 C to +50 C) and the Storage Humidity is 20% to 90% relative humidity, non condensing.

The IN-AET-055-PA should not be stored in atmospheres contaminated with Silicon. Storage in such atmospheres will cause degradation of sensitivity as well as malfunction. The sensor of the IN-AET-055-PA will be poisoned by Silicon compound.

LOW INDICATION

The measurement in an atmosphere contaminated with organic solvents, reducing gases such as nitrogen monoxide etc., or smoke may decompose the ozone or cause lower indication than actual concentration. When the presence of such gases or smoke is suspected, do not perform the measurement.

UNPACKING

Standard components listed below should be packed in each box. Carefully check the components with the list when unpacking. If any components are missing or damaged, contact your distributor or representative.

List of Standard Components

Items	Quantity
Ozone Spot Checker IN-AET-055-PA	1
Filter Holder (with Filter Element installed)	1
Filter Element (Spares)	3
Teflon sampling tube	1
Alkaline Battery (AA size)	2
AC Wall Adapter	1
Analog Voltage Output Connector & Cable	1
Operation Manual	1
CD - USB driver	1

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SPECIFICATIONS

Measuring Principle	Semiconductor Substrate Sensor Technology
Measuring Range	0 to 1,999 PPB _v
Units of Measure	PPB _v
Precision	± 30 PPB _v between 0 and 200 PPB _v ; +/- 15% above 200 PPB _v
Linearity	Better than 95% between 0 and 2 PPM _v
Response time	1.0 second (once the sensor has been on for 60 seconds or
Readout	3 ½ digit LCD display
Alarms	Audible and Visual
Analog output	0 to 1.999 VDC = 0 to 1,999 PPB _v
Digital Interface	USB port compatible for continuous data logging
Memory	On board memory to store over 2 days worth of continuous
Peak Hold Mode	Records and Displays highest value detected (standard)
Sampling Method	Built-in Micro Pump
Configuration	Hand Held
Dimensions (W x H x	75 x 134 x 24 mm (3 x 5.27 x 0.95") approx.
Weight	300 grams (0.66 lbs)
Diagnostic Features	Continuous internal diagnostics with error messages
Power Source	USB, AC Adapter (100 to 240 VAC), or 2 AA Batteries
Battery life	12 hours of continuous operation

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INSTRUMENT FUNCTIONS

This advanced state-of-the-art detector Portable Ozone Spot Checker IN-AET-055-PA is a microprocessor-controlled instrument designed for the measurement of ozone concentration as low as 0.01 ppm in the air. A large size liquid crystal display provides easy reading and two AA size alkaline batteries provide approximately 12 hours continuous operation. The IN-AET-055-PA can be powered through a USB computer port or USB AC wall adapter to prolong monitoring operation.

In case of using a USB computer port, it is sometimes needed to leave the batteries on in order to supply enough current for the pump ignition transient. After the transient, the batteries are no longer required and no energy will be drawn of them.

The IN-AET-055-PA provides the following additional functions:

1. Peak Hold Function

The IN-AET-055-PA will only display the highest value reached. The '+' display signal shows that this function is activated. The *change/enter* button is used to reset the peak value. Refer to the "Menu Chart" section for further information.

2. Analog Output

The current value of ozone concentration is reported instantly via the Analog Output data port. The output spans 0 to 2 Volt DC corresponding linearly to 0 to 2,000 PPBv (Parts per Billion by Volume)

3. Visual and audible configurable alarm

If the alarm is activated and the alarm level exceeded, the display will blink and an audible alarm will be heard. The alarm level can be adjusted through the menu. Refer to the "Menu Chart" section for further information.

4. Built-in sampling pump

A built-in sampling pump allows the user to spot for ozone leaks throughout the area.

5. USB port compatible

The current value of ozone concentration is reported instantly via the USB data port in ASCII. Additional configurations are performed through this port. Refer to the "RS-232 Digital Series Interface" section for further information.

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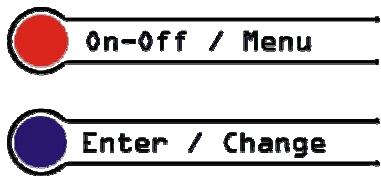
6. Data Storage

The IN-AET-055-PA features the capability of storing 215 measured values. The stored values are read via the USB port. The data rate is configurable by menu or by USB. Refer to the “*Menu Chart*” section for further information.

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MENU CHART

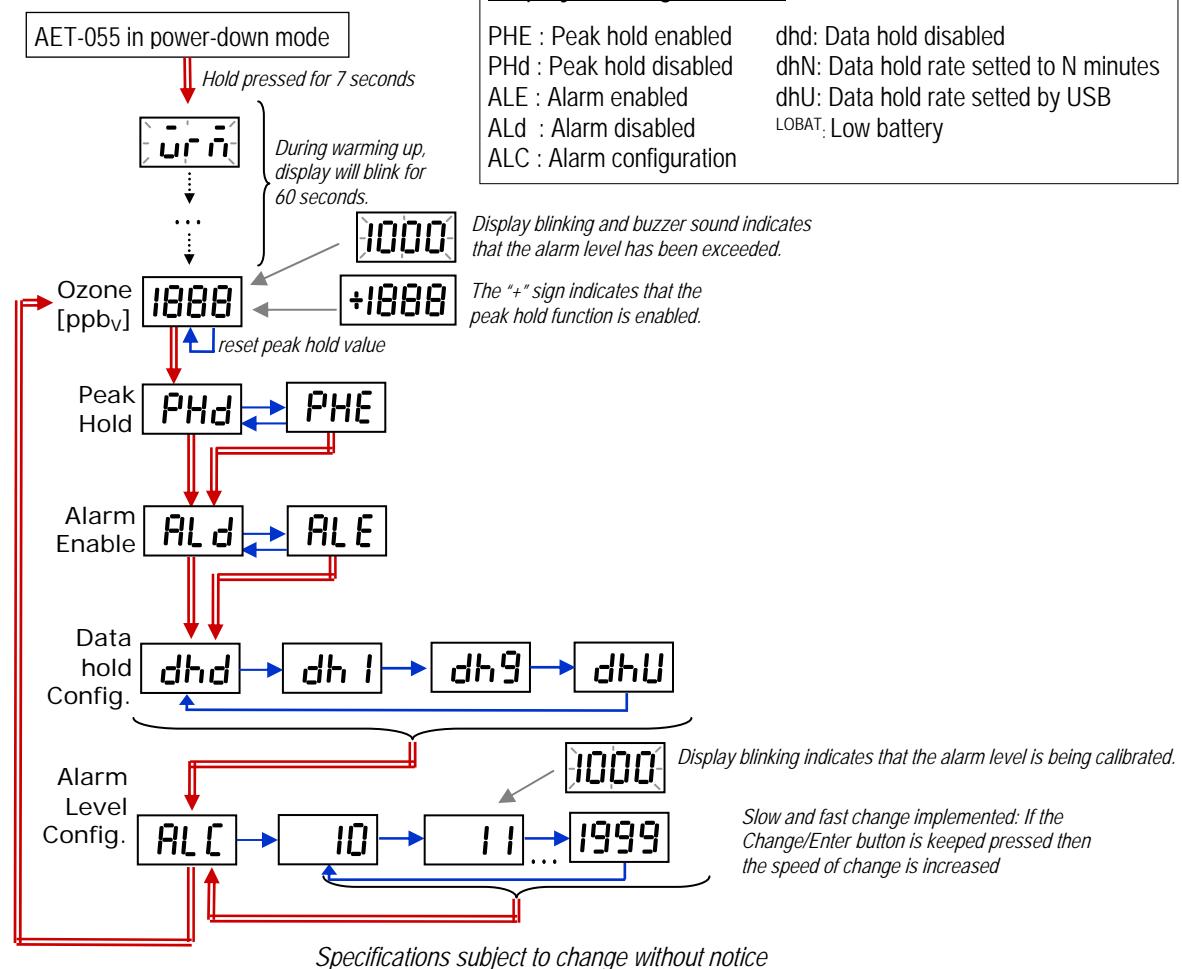
Buttons Diagram



Flow diagram description

- Pressing On/Off/Menu button transition
- Pressing Change/Enter button transition
-→ Automatic transition

Display messages flow diagram



Display messages codes:

PHE : Peak hold enabled	dhd: Data hold disabled
PHd : Peak hold disabled	dhN: Data hold rate setted to N minutes
ALE : Alarm enabled	dhU: Data hold rate setted by USB
ALd : Alarm disabled	LOBAT: Low battery
ALC : Alarm configuration	

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CONTROLS AND FUNCTIONS



Figure 1: Parts configuration of the IN-AET-055-PA

The function of each part is as follows:

1. Intake

The Filter Unit is attached to intake pneumatic port, which aspirates the ozone with the built-in air pump.

2. Exhaust

The sample drawn through the instrument is returned to atmosphere via this exhaust point.

3. ON-OFF / Menu button

Press this switch for power ON-OFF. The IN-AET-055-PA should be turned ON-OFF while keeping this switch pressed for 7 seconds. The button is also used to navigate through the menu. Refer to the “display chart and functions” for further information.

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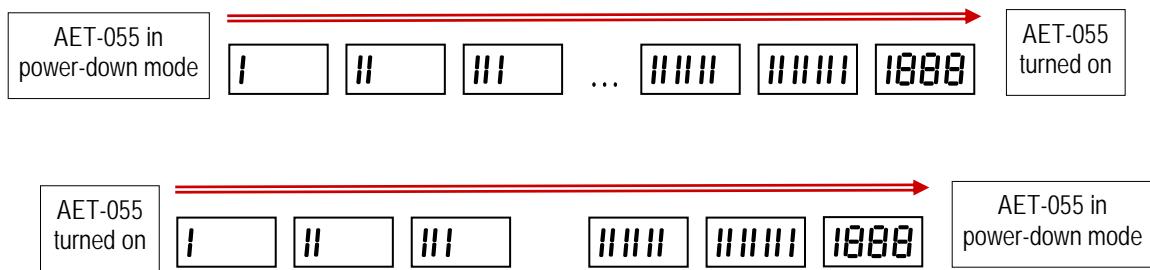


Figure 2: The turn ON/OFF sequence of the IN-AET-055-A

4. Enter / Change button

This button allows to change configurations through the menu and to reset the peak hold value. Refer to the “display chart and functions” section for further information.

5. LCD Display

The value of ozone concentration results are directly displayed in the digital LCD readout..

6. Battery Compartment

The battery compartment accommodates 2 AA-size rechargeable or alkaline batteries. Make sure polarities are correctly positioned. When alkaline batteries are used, the battery life is approximately 12 hours for continuous monitoring operation.

7. USB data port

The current value of ozone concentration is reported instantly via the USB data port in ASCII characters. This port is also used to connect the USB AC wall adapter to eliminate the batteries (for extended monitoring operation). Additional functionality and configuration operations are performed through this port. Refer to the “RS-232 Digital Serial Interface” section for additional information.

8. Analog Output

The unit produces an Analog Voltage, 0 to 2 Volt DC proportional to 0 to 2,000 PPB_V. This signal can be used to record the measured ozone concentration results. The unit is also fitted with a cable and connector that makes this voltage signal available for recording purposes

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9. Filter Unit

Filter Unit with the Filter Element traps particulate matter.

10. Teflon Sampling Tube

This tube is used to point the IN-AET-055-PA to an area in order to spot the ozone leak.

PRE-OPERATION

Installing the Batteries

WARNING

To prevent ignition of an explosive atmosphere, batteries must be loaded or changed in an area known to be non-explosive.

1. Open the Battery Compartment by pressing down and pulling back the Battery Compartment Cover.
2. Load the Batteries (2 AA-size rechargeable or alkaline batteries) with correct polarity. The correct polarity is indicated in the Battery Compartment.
3. Replace the Battery Compartment Cover.

NOTE:

Remove the batteries if the IN-AET-055-PA is not to be used for an extended period.

Connecting to a USB computer port or USB AC wall adapter

It is recommended to use a USB computer port or the USB AC wall adapter to power the IN-AET-055-PA to perform long monitoring operations. When connected in this manner, the Model IN-AET-055-PA power supply will be automatically switched from batteries to the USB port. If the USB power is then disconnected, the batteries will start powering the IN-AET-055-PA. This power source swapping operation can be performed while taking measurements with no risk of interrupting them.

Teflon Sampling Tube

The instrument is supplied with the Teflon Sampling Tube attached to the Filter Unit, and with the tip connected to the exhaust port.

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When measurement is to be performed disconnect the nozzle from the Exhaust port.

NOTE:

It is recommended to keep the Sampling Tube connected to the Exhaust port while the instrument is not used. This will protect the sensor by keeping other gases from entering the Filter Unit and reaching the sensor.

Heating time

After the IN-AET-055-PA is turned on, the display will blink for 90 seconds. The proprietary semiconductor substrate require this time interval to heat the sensor before perform any measurement results.

MEASUREMENT

WARNING

Do not use the IN-AET-055-PA for detecting mixtures other than ozone.

WARNING

Ozone (O_3) is a toxic gas. Once its presence has been detected, the operator should take all appropriate precautions to avoid exposure including vacating the area if necessary.

WARNING

Ozone (O_3) is a toxic gas. To limit exposure while measuring attach decomposing agent such as activated charcoal on the exhaust, or attach a tubing to keep the exhaust at a distance from the human body when high concentration ozone is monitored. Ozone decomposing device is not provided with the IN-AET-055-PA.

WARNING

Measurement performed near radio, walkie-talkie or device emitting strong electromagnetic waves may cause inaccurate readings.

WARNING

Do not turn on the IN-AET-055-PA without the Filter element inside the Filter holder. Dust may get into the micro pump causing excessive noise during sampling operation.

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1. Turn the IN-AET-055-PA on by pressing the *ON-OFF / Menu* button for 7 seconds. All the segments in the LCD display will be shown.
2. Wait until the IN-AET-055-PA sensor warming up is completed.
3. The IN-AET-055-PA is now in the Measurement Mode. Ozone concentration will be displayed. However, for accurate measurement, the measurement should be waited until warm up is completed. Wait approximately 30 minutes until warm up is completed.

NOTE:

In case the AET-055-PA is not operated for a period of more than a week, a lengthy warm up may be required until sensor output stabilizes

4. To shut down the operation, press the *ON-OFF / Menu* button for 7 seconds.

MAINTENANCE

Maintenance schedule

The IN-AET-055-PA is designed to operate with a minimum of maintenance. However, to maintain the best performance of it, follow the recommendations for maintenance schedule below:

1. The Intake / Filter element / Teflon sampling tube should always be kept clean. Check them before each operation.

NOTE:

A dirty filter may cause measurement to indicate a lower reading.

NOTE:

As ozone will adhere and decompose on the inner side of while the Teflon tubing for sampling is new, so it is recommended that aging of tubing be conducted.

2. The Intake / Filter element / Teflon sampling tube should be connected firmly. Check the connection before each operation. If necessary seal the connections with Teflon tape to ensure no leaks.
3. Aspiration of pump should be checked before each operation.

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Replacing the Filter Element

Before each measurement make sure that the filter is not clogged. If the Filter Element is clogged, replace with a new Filter Element according to the following instructions.

WARNING

The new Filter Element should be aged for approximately 2 hours before measurement. The reading on the LCD may be lower than actual concentration of ozone when the measurement is performed immediately after replacement.

1. Open the Filter Unit by unscrewing it.
2. Remove the old Filter Element.
3. Place the new Filter Element.

NOTE:

The Filter Element should be fitted with the rough surface facing upward. A new Filter Element can be used for about 10 days (continuous usage) in a clean atmosphere.

4. Close the Filter Housing Unit

RS-232 DIGITAL SERIAL INTERFACE

The RS-232 interface is implemented via a Mini USB Type B connector. Connect the IN-AET-055-PA to the PC using the USB cable. Please refer to the "Driver Installation for Windows XP" (included in the CD) for instructions to install the USB driver included in the CD.

The data structure is as follows:

- **Baud Rate:** 9600
- **Parity:** None (not even, not odd, not "space", not mark)
- **Data bits:** 8
- **Number of Stop bits:** 1

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When using “hyperterminal” or similar to connect to the IN-AET-055-PA, it is recommended to set the following options in *File -> Properties -> Settings -> ASCII Setup...*: “Append line feeds to incoming line ends” and “Echo typed characters locally”.

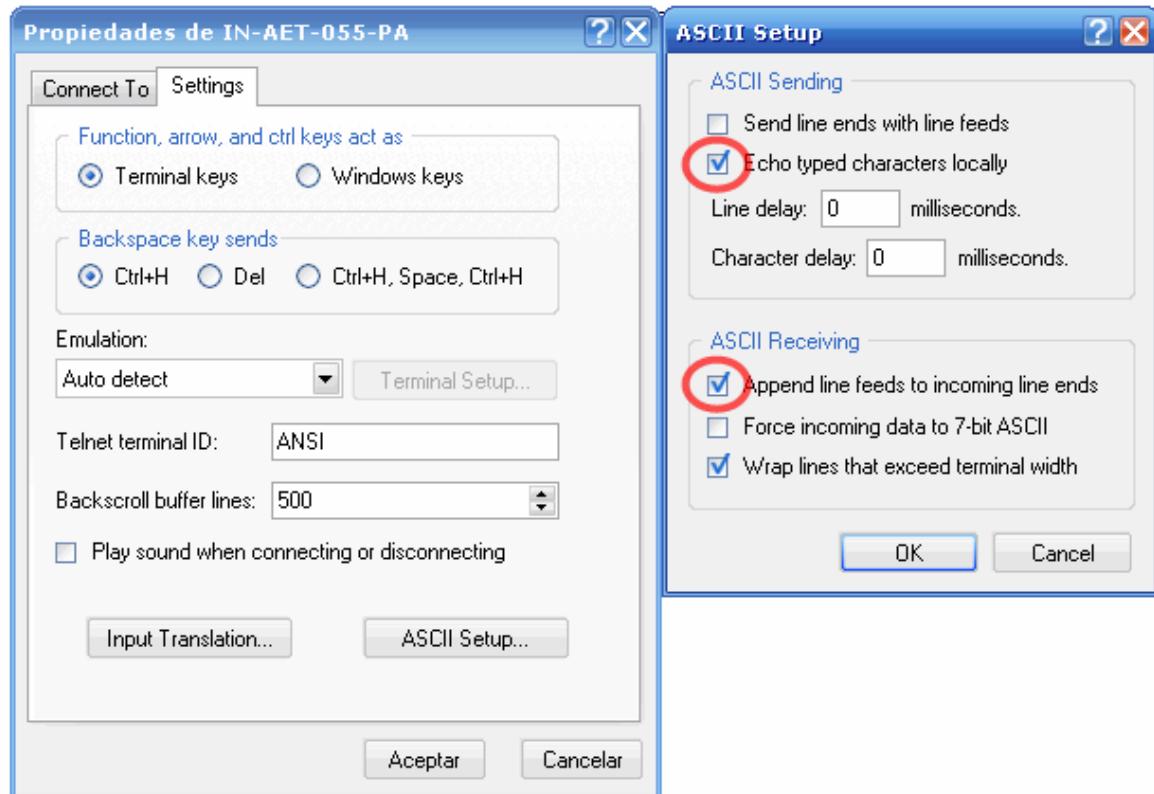


Figure 3: Recommended options for connecting to the IN-AET-0550PA

Following are the RS-232 accepted commands, and their syntax

Character	Command
Mnnnn	Set data hold interval in seconds (1 to 9999)
m	Disable data hold
R	Read stored values

“M” Command. Set data hold rate to 600 seconds

>M600

Data hold rate (in seconds): 600

Every time a new data hold rate is set, the memory is initialized and the previous stored values are erased.

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The “**m**” Command disables the data hold function

```
>m  
Data hold disable
```

This command doesn't erase the stored values. It only stop the IN-AET-055-PA of storing new values.

The “**R**” Command returns the stored values

```
>R  
Saved data  
0,125  
1,130  
2,131  
3,132  
4,133  
5,140
```

Here are six values stored. For example, if the data hold interval is set to 600 seconds (10 minutes) at 10.00 am, 125 corresponds to 10.00 am, 130 correspond to 10.10 am, 131 corresponds to 10.20 am and 140 corresponds to 10.50 am.

The IN-AET-055-PA is able to store 215 different values. When the memory is full, newer values overwrite older values. For example, if the data hold interval is set to 60 seconds (1 minute) at 10.00 am, three hours later the IN-AET-055-PA will return the following:

```
>R
```

```
Saved data
```

```
26,100
```

```
27,101
```

```
28,103
```

```
...
```

```
238,130
```

```
239,134
```

```
240,139
```

100 corresponds to 10.26 am, 134 corresponds to 12.59 pm and 139 corresponds to 13.00pm

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TROUBLESHOOTING

While performing measurements, certain problems as indicated in the following table may occur, rectifying the probable cause and remedy should eliminate the problem. If problem persists contact your authorized dealer for assistance.

PROBLEM	PROBABLE CAUSES	REMEDY
IN-AET-055-PA does not turn ON	a) No batteries b) Batteries are exhausted. c) Batteries are not installed properly. d) Switch is not pressed properly. e) Electrical circuit is not properly reset.	a) Install new batteries. b) Install new batteries. c) Install batteries with correct polarity. d) Press <i>ON-OFF / Menu button</i> firmly. e) Wait 3 minutes and press the <i>ON-OFF / Menu button</i> again.
IN-AET-055-PA does not turn OFF	a) Button was not pressed long enough.	a) Press the <i>ON-OFF / Menu button</i> for more than 7 seconds.
IN-AET-055-PA Does not properly indicate reading against ozone	a) Defective electronic circuit b) Defective pump	a) Contact your authorized dealer. b) Contact your authorized dealer.
IN-AET-055-PA Abnormal difference measurement value and expected value	a) Defective sensor b) Meter was not used for a prolong period. c) Measurement conducted under a extreme temperature / humidity atmosphere. e) Aging of filter not	a) Contact your authorized dealer. b) Leave the unit running for 15 - 20 minutes after warm up. c) Recheck by conducting measurement in a clean atmosphere. e) Turn power "ON" and allow sufficient aging for about 2 hours.

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